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*dias mombin* L.      Hogplum

Anacardiaceae      Cashew family

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/ John K. Francis

*Spondias mombin* L., also known as hogplum, yellow mombin (English), jobo, ciruela (Spanish), tapereba, and caja (Portuguese) (13), is a common, medium-sized forest tree (fig. 1) and grows throughout the Neotropics. It produces a sour, yellow fruit eaten by people and many animals. The soft wood is of minor commercial importance.

## HABITAT

### Native Range

The native range of hogplum extends along both the Pacific and Gulf coasts of central Mexico south through Central America, including the West Indies, to Ecuador, the Amazon Basin in Brazil, and Peru (16, 19, 20, 31, 34) (fig. 2), covering latitudes from about 25° N. to about 10° S. Some of this area, particularly some of the Antilles islands, may be naturalized range (25, 26). However, it has been in the West Indies a long time, possibly from pre-Columbian times. The species has also widely naturalized in Africa (15, 33) and other tropical areas and is extensively planted.

### Climate

Although some areas have rain in every month, most of the range has a dry season of 1 to 5 months. Hogplum grows in the Alisio Forests of Venezuela that receives 1000 to 2000 mm of mean annual precipitation and has mean annual temperatures of 23 to 28 °C (21). In Brazil, the species generally is found growing in areas with 1500 mm or more of precipitation per year (13). In Puerto Rico, hogplum grows in forests that receive from 1250 to 2000 mm of annual precipitation (author, personal observation). It also grows in dry areas as a riparian species.

### Soils and Topography

Hogplum grows on both upland and bottomland sites and in a wide variety of soils. Oxisols, Ultisols, and Inceptisols are apparently the most important orders of soils it grows in. Soil pH may vary from as low as 5.0 to over 7.0. The species also tolerates soils that are moderately low in nutrient concentration and have some degree of compaction. Sands through clays are colonized; soil drainage may vary from somewhat excessively drained (sandy or rocky) to

somewhat poorly drained (generally clayey). In floodplains of the Amazon Basin, the trees may endure waterlogging of soils for 2 to 3 months per year (13). In Mexico, hogplum grows from near sea level to a 1200-m elevation (31). It may sometimes be found on steep slopes, but more often grows on lower slopes, plains, and stream bottoms.



Figure 1.—Bole of hogplum (*Spondias mombin*) tree growing in a dry forest in Puerto Rico.

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**Figure 2.**—Native and naturalized range of hogplum (*Spondias mombin*) in tropical America. Dotted line indicates outer edge of range.

### Associated Forest Cover

Hogplum is usually associated with secondary forests but probably enters primary forests through natural disturbance. On a moist forest site in Puerto Rico, with clay soil over porous limestone parent material, hogplum is associated with *Andira inermis* (W. Wright) H.B.K., *Zanthoxylon martinicense* (Lam.) DC., *Thouinia striata* Radlk., *Nectandra coriacea* (Sw.) Griseb., and *Inga laurina* (Sw.) Willd. (author, personal observation). In gully bottoms in Barbados, hogplum is associated with *Ceiba pentandra* (L.) Gaertn., *Chlorophora tinctoria* (L.) Gaud., *Hura crepitans* L., *Citharexylum spinosum* L., *Hippomane mancinella* L., *Cercropia peltata* L., and *I. laurina* (Sw.) Willd. (18). A moist forest in Venezuela supported hogplum with *Bombacopsis sepium* Pittier, *Astronium graveolens* Jacquin, *Tabebuia* spp., *Hura crepitans* L., *Cordia alliodora* (Ruiz & Pav.) Oken, *Brosmum* spp., *Cedrela odorata* L., and *Pouteria* spp. (21).

### LIFE HISTORY

#### Reproduction and Early Growth

**Flowering and Fruiting.**—The tiny, yellow-white flowers are borne in panicles that arise from the axils of new leaves (25, 26). The trees are monoecious, the flowers being bisexual or occurring in panicles of male or female flowers. In the Antilles, the species flowers mainly from winter to summer, and fruit matures from summer to winter. The

fruit is a yellow, fleshy drupe about 2 to 2.5 cm thick and 3 to 4 cm long containing a multiseeded stone about 2.5 cm long.

**Seed Production and Dissemination.**—A sample of seeds from Puerto Rico averaged  $0.85 \pm 0.04$  g per seed (850 seeds per kilogram) (author, personal observation). Another sample from Mexico averaged 0.68 g per seed (680 seeds per kilogram) (3, 32). Large trees may produce more than 100 kg of fruit per year. Fruit and seed production usually begins when the tree is around 5 years old (13).

Howler monkeys, *Alouatta palliata*, feed on hogplums in Mexico, and they disperse the seeds over a 3-month period each year (12). Bats and birds, as well as deer, which swallow but do not digest the seeds, are also reported to be dispersal agents (27).

**Seedling Development.**—Germination is hypogeal (27). Seeds sown in Puerto Rico began germinating within 12 days of sowing (author, personal observation). A 90-percent germination was obtained within 20 days of sowing seeds in Mexico (3, 32). Some of the seeds produce two or more plants each. When this occurs, it is necessary to thin by pinching off all but one shoot. Seedlings in Puerto Rico that had been grown in nursery bags were ready to outplant at 3.5 months from sowing—when they averaged 48 cm in height (author, personal observation).

**Vegetative Reproduction.**—The tree is frequently propagated by placing branch cuttings in moist ground (13). Cuttings 50 to 100 cm long and 5 to 10 cm in diameter are usually stuck vertically with half their length exposed. In fact, living fences are established by setting freshly cut fenceposts into moist ground. Young trees coppice well, and large trees will sometimes sprout after cutting (27).

#### Sapling and Pole Stage to Maturity

**Growth and Yield.**—In the subtropical moist forest on St. John, U.S. Virgin Islands, hogplum made up 7 percent of the basal area ( $24 \text{ m}^2/\text{ha}$ ) and grew an average of 0.1 cm in diameter per year (36). Mean diameter growth of hogplum trees in two old tropical dry forest stands in Costa Rica ranged from 0.43 to 0.46 cm/yr (7). Hogplum trees in a younger stand in the same area averaged 0.69 cm/yr in diameter growth. Hogplum planted in four experimental plots in Campeche, Mexico, had a mean survival of 61 percent, a mean height of 7.9 m, and a mean d.b.h. of 14.2 cm after 9 years (3).

Hogplum was the 41st most important species (in terms of total basal area) in a 1980 survey of the commercial forest land of Puerto Rico and comprised a sawtimber cubic volume of  $10,000 \text{ m}^3$  (4). In three 1-ha plots in a secondary forest in Veracruz, Mexico, hogplum accounted for 8, 11, and 60 percent of basal areas (44, 56, and  $21 \text{ m}^2/\text{ha}$  respectively) (24). Another 1-ha plot in Oaxaca, Mexico, dominated by *Terminalia amazonia* (J.F. Gmel.) Exell, supported a basal area of  $23 \text{ m}^2/\text{ha}$ , 6 percent of which was hogplum (17).

Hogplum trees on good sites can grow quite large. Trees 39 m tall, with d.b.h.'s of 1.2 m and free of limbs to 24 m, were reported in South America (23). However, maximum heights of 20 to 30 m are more common throughout the range (13, 21, 31).



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A model was developed for predicting volume of hogplum boles in the State of Quintana Roo, Mexico (5). In this model, total bole volume including bark is equal to  $0.04690 + 0.39511 AD^2$ , where  $A$  is height and  $D$  is d.b.h. Bark thickness in Brazil is reported to vary from 2.0 to 4.5 cm (22).

**Rooting Habit.**—Seedlings produce long, thick, fleshy taproots. Older trees develop a large, spreading root system (27). On clayey soil, large horizontal roots protrude above the ground. Hogplum trees develop little or no buttress.

**Reaction to Competition.**—Hogplum is intolerant of shade at all stages of life (27). Seeds will germinate in shade, but seedlings must have full or nearly full sunlight to develop. Older trees must maintain a dominant or codominant position in closed stands or eventually die from suppression. Consequently, hogplum requires disturbance to become established. The most common habitats today are roadsides, pasture fencerows, logged areas, and old fields. Tree-fall gaps and other natural disturbances also allow occasional trees to become established.

**Damaging Agents.**—Hogplum is reported to be a preferred forage plant of the leaf-cutting ant, *Atta cephalotes* (L.), in Costa Rica (8). The fruits of hogplum can be infected by the dipterans *Anastrepha mombinpraeoptans* Seln, *Drosophila ampelophila* Loew, and *D. repleta* Wollaston (28). The wood is rated as very susceptible to attack by West Indian dry-wood termites, *Cryptotermes brevis* (Walker) (37). It has little resistance to decay by white- and brown-rot fungi (35). Because hogplum logs can sap stain quickly, rapid processing of harvested logs is advisable. The wood can be protected from rot with chemicals. After 4 years in the soil, test stakes treated with 5 percent pentachlorophenol in diesel were still unaffected by rot or termites (10).

In a survey of secondary forests in Puerto Rico, 8 percent of the hogplum timber trees were culled because of rot and 16 percent were culled for other reasons (2). Poor form and the presence of nails and wire in trees are serious impediments to utilization in Puerto Rico.

## SPECIAL USES

Wild and semicultivated hogplum trees produce many fruits that are eaten fresh and made into jellies and drinks by local people. The mesocarp of the fruit (the part eaten) is 70 percent water and contains an average of 104 cal/g. By dry weight, it contains 27 percent carbohydrates, 0.6 percent crude fiber, 0.2 percent fat, and 1.0 percent ash. Also, the fruit supplies 20 mg Ca, 49 mg P, 1 mg Fe, 55 mg vitamin C per 100 g, plus significant quantities of vitamin A, thiamin, riboflavin, and niacin (29).

The sour young shoots are sometimes eaten raw or cooked as a vegetable (26). Sucking on a large piece of root will yield enough good-quality water to satisfy the thirst of a wayfarer (25). The flowers are a source of nectar for honeybees, and the resulting honey is amber colored (11). Hogplum is commonly used as a living fencepost (30).

Young hogplum can be an important browse plant. When placed in a savanna pasture in Nigeria containing six browse species and one grass species, sheep and goats took 27 and 30 percent, respectively, of their forage from hogplum (6). Analysis of the dry forage of hogplum gave 6

percent ash, 7 percent fat, 14 percent protein, 17 percent fiber, and 56 percent carbohydrates. Aqueous and ethanolic extracts of hogplum leaves inhibit the growth of some gram-positive and gram-negative bacteria (1).

The heartwood and sapwood, not easily distinguishable, are cream to tan colored. The wood has a medium luster and medium to coarse texture with a mostly straight grain (9). It is relatively light weight, and ovendry density averages  $0.40 \text{ g/cm}^3$  (23). The wood air-dries rapidly with slight cupping, twisting, bowing, and casehardening (22). Shrinkage during drying is 2.7 percent radial, 4.7 percent tangential, and 7.5 percent volumetric (9). Hogplum has good strength for its weight, comparable to yellow-poplar (*Liriodendron tulipifera* L.). At 12-percent moisture content, hogplum tested at  $619 \text{ kg/cm}^2$  for bending strength,  $90,000 \text{ kg/cm}^2$  for modulus of elasticity, and  $310 \text{ kg/cm}^2$  for maximum crushing strength (35). The wood works easily and generally finishes smoothly, although fuzzy grain may result from some operations (9). Hogplum wood is recommended for light construction, molding, utility plywood and paneling, boxes, and fenceposts (22). A good short-fiber pulp suitable for printing paper can be produced by the soda process (14).

## GENETICS

Hogplum has been known by the botanical synonyms, *Spondias myrobalanus* L., *S. lutea* L., *S. lutea* var. *maxima* Engler., *S. lutea* var. *glabra* Engler., *S. radlkoferi* J.D., and *S. nigrescens* Pittier (13, 29). *Spondias lutea*, found in Brazil, may eventually be recognized as a distinct species or subspecies. The Brazilian tree's fruit tends to be an orange color and has a better flavor (13).

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